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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/604,866	08/22/2003	Kazutaka MIURA	030983	1865
23850	7590	07/12/2004	EXAMINER	
ARMSTRONG, KRATZ, QUINTOS, HANSON & BROOKS, LLP 1725 K STREET, NW SUITE 1000 WASHINGTON, DC 20006			NGUYEN, THANH T	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 07/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/604,866

Applicant(s)

MIURA, KAZUTAKA

Examiner

Thanh T. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 5-17 is/are rejected.
- 7) ☒ Claim(s) 4 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 8/29/09
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____

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DETAILED ACTION

Priority

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119 (a)-(d).

Information Disclosure Statement

The information disclosure statement filed on 8/29/03 has been considered.

Oath/Declaration

Oath/Declaration filed on 8/22/03 has been considered.

Specification

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 102

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The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 12-16 are rejected under 35 U.S.C. 102(b) as being anticipated by the Admitted Prior Art, Figures 1a-1c, Pages 1-5, Paragraphs# 3-15 of the prior art of the present application.

Referring to figures 1a-1c, The Admitted Prior Art teaches a method of manufacturing a semiconductor device comprising the steps of:

Forming a first insulating layer (102) over a semiconductor substrate (101);

Forming a first conductive layer (103), an oxide dielectric layer (104), and a second conductive layer (105) over the first insulating layer;

Forming a capacitor (Q_c), which consists of an upper electrode (105a) made of the second conductive layer, a dielectric layer made of the oxide dielectric layer (104a), and a lower electrode (103a) made of the first conductive layer by patterning the second conductive layer, the oxide dielectric layer, and the first conductive layer (see figure 1b);

Forming a second insulating layer (106) over the capacitor and the first insulating layer;

Forming a hole (106a) in the second insulating layer over the upper electrode (105a); and

Supplying an activated oxygen to the capacitor via the hole in a state that the semiconductor substrate is heated (see figure 1C, paragraphs# 12-13).

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Regarding to claim 12, second conductive layer is made of at least one of iridium and iridium oxide (see paragraph# 12).

Regarding to claim 13, the oxide dielectric layer is ferroelectric layer (see paragraph#12).

Regarding to claim 14, forming an upper electrode leading wiring which is connected electrically to upper electrode via the hole, on the second insulating after the oxygen is supplied to the capacitor (see paragraph# 10).

Regarding to claim 15, forming a contact hole on an upper surface of the lower electrode in an area, which protrudes from the upper electrode, by patterning the second insulating layer, and forming a lower electrode leading wiring, which is connected electrically to the lower electrode via the contact hole on the second insulating layer (see paragraph# 10, figure 1C)

Regarding to claim 16, the step of forming conductive plug in the contact hole (107, figure 1C).

Claims 1, 6, 13-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Koo (U.S. Patent No. 6,368,909).

Referring to figures 1a-1c, The Admitted Prior Art teaches a method of manufacturing a semiconductor device comprising the steps of:

Forming a first insulating layer (6) over a semiconductor substrate (1);

Forming a first conductive layer (7) an oxide dielectric layer (8), and a second conductive layer (9) over the first insulating layer;

Forming a capacitor (10), which consists of an upper electrode (9) made of the second conductive layer, a dielectric layer made of the oxide dielectric layer (8), and a lower electrode

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(7 made of the first conductive layer by patterning the second conductive layer, the oxide dielectric layer, and the first conductive layer (see figure 2a);

Forming a second insulating layer (11/13) over the capacitor and the first insulating layer;

Forming a hole (see figure 2d, col. 5, lines 38-45) in the second insulating layer over the upper electrode (9); and

Supplying an activated oxygen to the capacitor via the hole in a state that the semiconductor substrate is heated (see figure 2d, col. 5, lines 38-45).

Regarding to claim 6, heating the capacitor to the temperature of 300-450°C (see col. 5, lines 38-45)

Regarding to claim 13, the oxide dielectric layer is ferroelectric layer (see col. 4, line 32).

Regarding to claim 14, forming an upper electrode leading wiring which is connected electrically to upper electrode via the hole, on the second insulating after the oxygen is supplied to the capacitor (see figure 2d).

Regarding to claim 15, forming a contact hole on an upper surface of the lower electrode in an area, which protrudes from the upper electrode, by patterning the second insulating layer, and forming a lower electrode leading wiring, which is connected electrically to the lower electrode via the contact hole on the second insulating layer (see figure 2d)

Regarding to claim 16, the step of forming conductive plug in the contact hole (14, figure 2d).

Claims 1, 6, 12-17 are rejected under 35 U.S.C. 102(e) as being anticipated by Joo et al. (US Publication No. 20030141527).

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Referring to figures 2-4, 23-26, Joo et al. teaches a method of manufacturing a semiconductor device comprising the steps of:

Forming a first insulating layer (74) over a semiconductor substrate (51);

Forming a first conductive layer (77), an oxide dielectric layer (79), and a second conductive layer (81) over the first insulating layer;

Forming a capacitor (82), which consists of an upper electrode (81) made of the second conductive layer, a dielectric layer made of the oxide dielectric layer (79), and a lower electrode (77) made of the first conductive layer by patterning the second conductive layer, the oxide dielectric layer, and the first conductive layer (see figure 2);

Forming a second insulating layer (95) over the capacitor and the first insulating layer;

Forming a hole (see figure 26) in the second insulating layer over the upper electrode;
and

Supplying an activated oxygen to the capacitor via the hole in a state that the semiconductor substrate is heated (see figure 26, paragraphs# 88-89).

Regarding to claim 6, heating the capacitor to the temperature of 300-450°C (see paragraph 86)

Regarding to claim 12, second conductive layer is made of at least one of iridium and iridium oxide (see paragraph# 71).

Regarding to claim 13, the oxide dielectric layer is ferroelectric layer (see paragraph# 71).

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Regarding to claim 14, forming an upper electrode leading wiring which is connected electrically to upper electrode via the hole, on the second insulating after the oxygen is supplied to the capacitor (see figure 23-24).

Regarding to claim 15, forming a contact hole on an upper surface of the lower electrode in an area, which protrudes from the upper electrode, by patterning the second insulating layer, and forming a lower electrode leading wiring, which is connected electrically to the lower electrode via the contact hole on the second insulating layer (see figure 23-24)

Regarding to claim 16, the step of forming conductive plug in the contact hole (99, figure 24).

Regarding to claim 17, forming a conductive plug (75), which is connected to a lower surface of the lower electrode, before the first conductive layer is formed on the first insulating layer (see figure 2).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-11, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Admitted Prior Art, Figures 1a-1c, Pages 1-5, Paragraphs# 3-15 of the prior art of the present application

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as applied to claims 1, 12-16 above, in view of Isobe et al. (U.S. Patent No. 6,114,199) and Koo (U.S. Patent No. 6,368,909).

The Admitted Prior Art teaches a method of forming a capacitor and supplying an oxygen to the capacitor via the hole in a state that the semiconductor substrate is heated. However, the Admitted Prior Art does not teach oxygen is activated by irradiating any one of ultraviolet rays and a microwave, also a heater, infrared lamp arranged over the semiconductor substrate and a heater arranged below the semiconductor substrate, oxygen that is activated by irradiating the ultraviolet rays is oxygen radical, the temperature range, the excimer UV lamp wavelength, the microwave is irradiated from a conductive coil that is connected to a microwave power supply, oxygen is introduced into a low-pressure atmosphere in which the semiconductor substrate and then the microwave is irradiated to the oxygen, the oxygen is introduced into a space over the second insulating layer together with an inert gas, and forming a conductive plug, which is connected to a lower surface of the lower electrode, before the first conductive layer is formed on the first insulating layer.

Referring to figure 7, Isobe et al. teaches oxygen is activated by ArF excimer ultraviolet light (see col. 12, lines 26-52, meeting claims 2-3), the microwave is irradiated from a conductive coil that is connected to a microwave power supply (see col. 12, lines 36-37), oxygen is introduced into a low-pressure atmosphere in which the semiconductor substrate (see col. 12, lines 40-52) and then the microwave is irradiated to the oxygen, oxygen that is activated by irradiating the ultraviolet rays is oxygen radical (see col. 12, lines 34-36), forming a conductive plug (42), which is connected to a lower surface of the lower electrode (22), before the first conductive layer (22) is formed on the first insulating layer (20) (meeting claim 17).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would forming a conductive plug before forming a conductive layer to form a lower electrode in process of the Admitted Prior Art as taught by Isobe et al. because the process would provide the contact of source/drain to the transfer gate.

Koo teaches forming an opening to expose the capacitor and introducing oxygen to the opening and anneal in the atmosphere at less than about 450°C (see col. 5, lines 38-45).

Therefore, it would have been obvious to a person of ordinary skill in the art to anneal oxygen atmosphere at less than about 450°C in process of the Admitted Prior Art as taught by Koo because the process would have low stress variation.

The temperature range and the wavelength range are considered to involve routine optimization while has been held to be within the level of ordinary skill in the art. As noted in *In re Aller*, the selection of reaction parameters such as temperature and concentration would have been obvious:

"Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art...such ranges are termed "critical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."

In re Aller 105 USPQ233, 255 (CCPA 1955). See also *In re Waite* 77 USPQ 586 (CCPA 1948); *In re Scherl* 70 USPQ 204 (CCPA 1946); *In re Irmscher* 66 USPQ 314 (CCPA 1945); *In re Norman* 66 USPQ 308 (CCPA 1945); *In re Swenson* 56 USPQ 372 (CCPA 1942); *In re Sola* 25 USPQ 433 (CCPA 1935); *In re Dreyfus* 24 USPQ 52 (CCPA 1934).

Therefore, one of ordinary skill in the requisite art at the time the invention was made would have used any temperature range and wavelength range suitable to the method in process of the Admitted Prior Art in order to optimize the process.

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Allowable Subject Matter

Claim 4 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on (571) 272-1702. The fax phone number for this Group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (**See MPEP 203.08**).



Thanh Nguyen
Patent Examiner
Patent Examining Group 2800

TTN